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## **The Change of Ocular Blood Flow after Topical Instillation of Unoprostone Eye Drops**

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### Abstract

### Introduction

Recently, the role of the ocular blood circulation is often discussed in the glaucoma research field. Some eye drops are confirmed to improve ocular blood circulation assessed by color Doppler imaging.

### Materials & Methods

### Results

### Discussion & Conclusion

### References

Unoprostone (ResculaR) is a prostaglandin-related compound which lowers the intraocular pressure in human by increasing the trabecular and uveoscleral aqueous outflow and causes no effect on the pupil or accommodation.<sup>1</sup> Sugiyama<sup>2</sup> measured the change of the ocular blood flow in rabbits after the topical application with unoprostone by using thermography. He concluded that topically applied unoprostone had a favorable effect upon the ocular circulation in rabbits. We investigated the change of the ocular blood flow after the topical instillation of unoprostone eye drops on the right eye of the normal subjects by using color Doppler imaging.

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### Discussion Board

## **Materials and Methods**

### *Method*

The LOGIQ500 color Doppler unit (GE Medical System) with a 6.5MHz linear phase transducer was used to examine all of the subjects. Color-encoded blood flow of the central retinal artery (CRA) can be seen in the B-scan image of the optic nerve. The short posterior ciliary artery (PCA) is depicted just adjacent to the optic nerve within the retrobulbar space. The change of ocular blood flow was investigated after the topical instillation of unoprostone eye drops on the right eye of the normal subjects using color Doppler imaging. Both eyes of all the subjects were checked by the same examiners (YI,AN). Before and two hours after the application of unoprostone eye drops, we performed color Doppler imaging and pulse Doppler method to detect the blood flow of the CRA and PCA. The intraocular pressure, systemic blood pressure and pulse rate of all the subjects were measured before and two hours after the instillation of the eye drops.

### *Subjects*

Eighteen normal subjects were examined. Fourteen subjects were female and four were male. The ages of the subjects ranged from 60 to 84 years old. The mean age was 71

years old. After precise explanations of the procedure were given, consent was granted by all of the subjects.

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## Results

Peak-systolic, mean, and end-diastolic blood flow velocities were increased after the application of unoprostone eye drops for both CRA and PCA. ( $p < 0.01$ , Fig.1,2) Pulsatility indices were not changed in either vessels. The intraocular pressure was significantly decreased. ( $p < 0.01$ , Fig.3) Heart rate was significantly decreased. ( $p < 0.01$ , Fig.4) The systolic and diastolic systemic blood pressure was not changed.

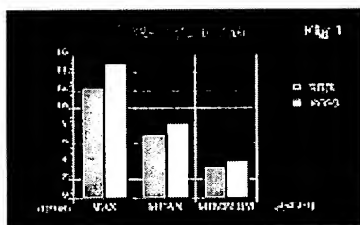


Fig. 1 (Click to enlarge)

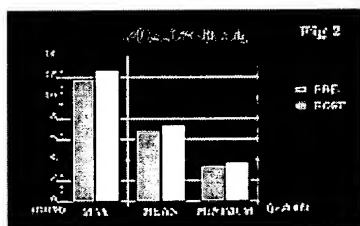


Fig. 2 (Click to enlarge)

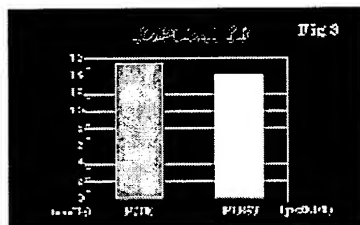


Fig. 3 (Click to enlarge)

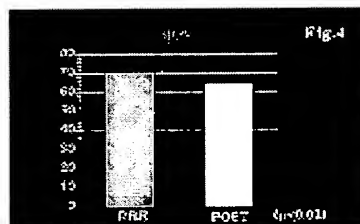


Fig. 4 (Click to enlarge)

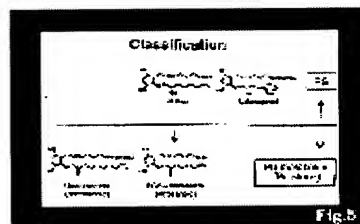


Fig. 5 (Click to enlarge)

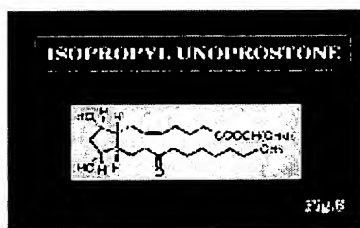


Fig. 6 (Click to enlarge)

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## Discussion and Conclusion

### Discussion

Unoprostone (ResculaR) is a novel prostaglandin-related compound produced by Ueno Fine Chemicals Industry Ltd. (Osaka, Japan). Unoprostone lowers the intraocular pressure by increasing the trabecular and uveoscleral aqueous outflow and has no effect on the pupil and accommodation.<sup>1</sup> Unoprostone is similar to Latanoprost but different from Latanoprost in several points.(Fig.5) The Latanoprost is a direct derivative of the PGF<sub>2</sub>-alpha. Unoprostone is a derivative of the non-active metabolized PGF<sub>2</sub>-alpha and its pharmacological effect is weaker than the Latanoprost.(Fig.6) Latanoprost causes the iris color change. Unoprostone doesn't have such a side effect. Sugiyama<sup>2</sup> measured the change of the ocular blood flow in rabbits after the topical application of unoprostone by using thermography. He concluded that topically applied unoprostone has a favorable effect upon the ocular blood circulation in rabbits.

In human eyes, the improvement of the chorio-retinal blood circulation was assessed by using a laser speckle tissue circulation analyzer for the application of the unoprostone eye drops<sup>3</sup>. In the rabbits' eyes, the improvement of the choroidal blood circulation was assessed by using the hydrogen clearance method for the application of the unoprostone eye drops.<sup>4,5</sup> In this experiment, we found that topically applied unoprostone improves the ocular blood circulation. It is very important to estimate the effect of glaucoma drugs on the ocular blood circulation with regard to glaucoma therapy. The ocular blood flow can be assessed by laser Doppler, laser speckle and color Doppler imaging method. The color Doppler imaging can only measure the blood flow in the short posterior ciliary artery which locates around the lamina cribrosa of the optic nerve. It is clear that the most susceptible point of the axon fiber against the intraocular pressure is around the lamina cribrosa where the supporting connective tissue is weaker than the other area of the eye. I believe that the color Doppler imaging is the best way to evaluate the ocular blood circulation in the glaucomas among these three methods.

### Conclusions

Unoprostone eye drops not only lowers the intraocular pressure but also improves the ocular blood circulation of the retina and optic nerve around the lamina cribrosa in human eyes. Unoprostone has no unfavorable effect on the peripheral vascular resistance either the iris color in human eyes. The color Doppler imaging is the most suitable method to assess the ocular blood circulation in glaucoma.

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